Washington State Department of Transportation

Design Manual Supplement

/s/ Harold Peterfeso
State Design Engineer

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Urban Roadways

I. Introduction

A. Purpose

To modify the Washington State Department of Transportation (WSDOT) design criteria for roadways in urban areas.

B. References

RCW 47.50, Highway Access Management

RCW 46.51.575, Additional parking regulations

RCW 46.61.150, Driving on divided highways.

WAC 468-51, Highway Access Management — Access Permits — Administrative Process

WAC 468-52, Highway Access Management — Access Control Classification System and Standards

Design Manual, M 22-01, WSDOT

C. Background

In the urban environment, development has limited the space available for all of the competing roadway needs such as lanes for capacity, shoulders, medians, sidewalks, and parking. Because of this, providing roadways that meet full design level in developed areas is often difficult.

Roadway design guidance developed for rural and limited access highways is not always appropriate for urban roadways. The existing guidance provides for higher design speeds; with wider lanes, shoulders, and medians than necessary for the developed urban environment. This has resulted in a higher level of design at a higher project cost.

D. Discussion

1. Design Speed

The design speed is the speed used to determine the various geometric design features of the roadway. Sight distance, superelevation, and maximum grade are the main design elements that depend on the design speed. A uniform design speed throughout a corridor provides consistent features that produce acceptable operating speeds.

The existing full design level design speed guidance does not fully account for roadside development. Before May 2001, the design speed could be selected

from a range of speeds. The May 2001 *Design Manual* revision to Chapter 440 removed the lower end of the range leaving the required design speed as the high end of the range. This removed the designer's ability to select a design speed appropriate for the development in the area. The required design speeds are frequently higher than necessary for the conditions in urban areas.

Design speed is revised to restore the minimum design speeds values removed May 2001. A corridor analysis may be used to select an appropriate design speed for the roadway setting, with the posted speed as the minimum.

2. Lane Width

Lane width has an influence on safety, comfort, and capacity. Lanes 12 ft wide provide desirable clearance between large vehicles for safety and comfort. They also provide full capacity. Narrower lanes will have an adverse impact on the traffic flow. However, 11 ft lanes provide minimum clearance and the added benefit to traffic for wider lanes in developed urban areas is often less than the additional cost.

For roadways on the NHS, 12 ft lanes are preferred. For non NHS managed access highways, the minimum lane width is reduced to 11 ft, except when truck volumes and speeds are high.

3. Shoulder

There are many functions of a shoulder along the traveled way. In an urban environment the benefits that shoulders provide include:

- Separation from curbs to reduce driver shifting (shy distance)
- Improved capacity
- Areas for bike and pedestrian use
- Room for large vehicle tracking for turning movements

Before May 2001, when curb section was used the WSDOT *Design Manual* said, "… a 6 ft shoulder outside the face of curb is acceptable. See Chapter 910 for shy distances at curbs." Chapter 910, "Intersections at Grade" called for a 1 ft shy on the left with 11 ft or wider lanes and 2 ft on the right. Except, on the right, "For noncontinuous curbs or where bicycles are anticipated, the minimum shy distance to the face of the curb is 3 ft." This often resulted in confusion and the 6 ft requirement not being met.

With the May 2001 revision to the *Design Manual*, the terminology for this area was changed from "shy distance" to "shoulder" and the guidance was moved to Chapter 440, "Full Design Level". At the same time, the right shoulder width requirement increased to 4 ft to provide more room for bicyclists. The left shoulder width requirement was revised to provide a lane/shoulder width of 13 ft when the Design Speed is less than 50 mph. These criteria have been shown to be impractical for many of the projects being developed in urban areas.

For turn lanes, because traffic speeds and volumes are low, the need for shoulders is reduced to providing structural support and room for bike and pedestrian use. Where adjacent curb and sidewalk are provided, the need for shoulders adjacent to the turn-lane is eliminated.

The shoulder width for urban managed access highways is changed to be more practical in developed areas.

4. Median

A median is the portion of a highway separating the traveled ways for traffic in opposite directions. Medians separate opposing traffic streams, provide space for left turn lanes, control left turns, minimize headlight glare, and provide space for landscaping and storm water treatment.

Medians used on urban managed access highways have not been fully addressed in the *Design Manual*. The manual has covered medians commonly used in rural areas (depressed) and limited access highways in urban areas (barrier separated), but raised medians, which are common in urban areas, have not been included.

Guidance is added for medians on managed access highways in urban areas.

5. Superelevation

In urban areas, roadside development often makes superelevation impractical. To allow for this, AASHTO provides a different method for calculating superelevation with higher allowable side friction for low-speed urban roadways. The result is a reduction in the minimum radius for normal crown and a reduction in minimum radius at full superelevation. The low-speed urban roadway superelevation has not previously been included in the *Design Manual*. To allow more flexibility on low-speed urban managed access highways, the AASHTO low-speed urban roadway superelevation is adopted for urban managed access highways.

E. Implementation

This change is effective on the date of this supplement and will expire when the changes are incorporated in the *Design Manual*.

II. Instructions

A. Replace note 3, Figure 430-3 and note 4, Figure 430-4 with the following:

When curb section is used, the minimum shoulder width from the edge of traveled way to the face of curb is 4 ft. In urban areas, see Chapter 440. On designated bicycle routes, the minimum shoulder width is 4 ft (See Chapter 1020).

B. Replace the last paragraph of 440.07 with the following:

Select a design speed for urban arterial streets and highways with some access control and fairly long distances between intersections as discussed above. For highways in urban areas, see 440.16(3) for design speed determination.

C. Add the attached new 440.16 "Urban Roadways" to the end of Chapter 440. (Pages 5-7.)

D. Replace existing Figures 440-4 through 440-7b with the attached revised Figures. 440-4 through 440-8. (Pages 8-15)

E. Add the following to 640.05 "Superelevation".

(6) Low-Speed Urban Managed Access Highway Superelevation

Curves on low-speed Urban Managed Access Highways may be superelevated using a higher side friction. Figure 640-12b may be used to determine superelevation for Urban Managed Access Highways with a design speed of 40 mph or less.

F. Add new Figure 640-12b to Chapter 640. (Page 16)

440.16 Urban Roadways

(1) Definitions

divided multilane A roadway with 4 or more lanes and a median that physically or legally prohibits left-turns, except at designated locations.

limited access highway All highways where the rights of direct access to or from abutting lands have been acquired from the abutting landowners.

managed access highway All highways where the rights of direct access to or from abutting lands have not been acquired from the abutting landowners.

median The portion of a highway separating the traveled ways for traffic in opposite directions.

rural area An area that meets none of the conditions to be an urban area.

suburban area A term for the area at the boundary of an urban area. Suburban settings may combine higher speeds common in rural areas with activities that are more similar to urban settings. Separate design values are not given for suburban areas, classify suburban areas as either urban or rural as best fits the existing or design year conditions.

two-way left-turn lanes (TWLTL) A lane, located between opposing lanes of traffic, to be used by vehicles making left turns from either direction, either from or onto the roadway.

undivided multilane A roadway with 4 or more lanes on which left-turns are not controlled.

urban area An area defined by one or more of the following:

- Within a federal urban area boundary as designated by FHWA.
- Characterized by intensive use of the land for the location of structures and receiving such urban services as sewer, water, and other public utilities and services normally associated with urbanized areas.
- With not more than twenty-five percent undeveloped land.

(2) Design Class

The design class of limited access highways on the state system in urban areas is controlled by the functional class (See Figures 440-4 through 7b.)

The urban managed access highway design class (Figure 440-8) may be used on all managed access highways in urban areas, regardless of the functional class.

(3) Design Speed

For limited access facilities, the design speed is given for each design class in Figures 440-4 through 7b.

For access managed facilities in urban areas, select a design speed based on figure 440-1. In cases where the 440-1 design speed does not fit the conditions, a corridor analysis may be used to select a design speed. Select a design speed not less than the posted speed and logical with respect to topography, operating speed (or anticipated operating speed for new alignment), adjacent land use, design traffic volume, accident history, access control, and the functional classification. Consider both year of construction and design year. Maintain continuity throughout the corridor, with changes at logical points, such as a change in roadside development.

(4) Lanes

Figure 440-8 gives the minimum lane widths for urban managed access highways. See Chapter 640 for guidance on width requirements on turning roadways. The width for two-way two-lane turning roadways and two-lane one-way turning roadways given in the figures in Chapter 640 are based on 12 ft minimum lane widths. When 11 ft minimum lane widths are used, the widths from the figures may be reduced by 2 ft.

(5) Shoulders

Figure 440-8 gives the minimum shoulder widths for urban managed access highways without curb. When a curb section with a height of 8 in or less is used, the minimum shoulder width is given in Figure 440-3a. When a curb or barrier with a height between 8 in and 2 ft is used adjacent to the roadway, the minimum shoulder width is 2 ft. When traffic barrier with a height of 2 ft or greater is used adjacent to the roadway, the minimum shoulder width from the edge of traveled way to the face of the traffic barrier is 4 ft. Additional shy distance for traffic barrier is not normally required on urban managed access highways.

Lane Width	Posted Speed			
	>45 mph	≤45 mph	>45 mph	≤45 mph
	On Left		On Right (2)	
12 ft or wider	4 ft	1 ft (1)	4 ft	2 ft
11 ft	4 ft	1 ft (1)	4 ft	3 ft (3)

Notes:

(1) When mountable curb is used on routes with a posted speed of 35 mph or less, shoulder width is desirable but, with justification, curb may be placed at the edge of traveled way.

(2) When the route has been identified as a local, state, or regional significant bike route, the minimum shoulder width is 4 ft. See Chapter 1020 for additional bicycle considerations.

(3) When bikes are not a consideration, may be reduced to 2 ft with justification.

(4) Measured from the edge of traveled way to the face of the curb.

Shoulder Width for Curbed Sections (4) - Urban
Figure 440-3a

Where there are no sidewalks the minimum shoulder width is 4 ft. Shoulder widths less than 4 ft will require wheelchairs using the roadway to encroach on the through lane.

The need for shoulders adjacent to turn lanes, on urban managed access highways, is reduced. For roadways without curb sections, the shoulder adjacent to turn lanes may be reduced to 2 ft on the left and 4 ft on the right. When a curb and sidewalk section is used with a turn lane 400 ft or less in length, the shoulders adjacent to turn lanes may be eliminated. The design of the intersection may need to be adjusted to allow for vehicle tracking. On routes where bicycles are provided for, continue the bicycle facility between

the turn lane and the through lane. (See Chapter 910 for information on turn lanes and Chapter 1020 for information on bicycle facilities.)

For routes identified as local, state, or regional significant bicycle routes, provide a minimum 4 ft shoulder. Maintain system consistence for the bicycle route, regardless of jurisdiction and functional class. See Chapter 1020 for additional information on bicycle facilities.

(6) Medians

Medians are either restrictive or nonrestrictive. Restrictive medians limit left-turns, physically or legally, to defined locations. Nonrestrictive medians allow left-turns at any point along the route. Consider restrictive medians when the DHV is over 2000.

A common form of restrictive median in urban areas is the raised median. When the median is to be landscaped or where rigid objects are to be placed in the median, see *Design Manual* Chapter 700 for clear zone requirements. The width of a raised median may be minimized by using a dual-faced cement concrete traffic curb, a precast traffic curb, or an extruded curb.

A two-way left-turn lane (TWLTL) may be used as a nonrestrictive median for an undivided roadway with a DHV of 2500 or less. The desirable width of a TWLTL is 13 ft with a minimum width of 11 ft. (See Chapter 910 for additional information.)

The traffic volume limits for restrictive medians and TWLTLs are based on WAC 468-52. For more exact values, see the WAC.

(7) Parking

Parallel parking may be permitted on urban managed access highways as shown on Figure 440-8. The widths given are minimum. Provide wider widths when practical.

Angle parking is not permitted on any federal aid or state route without approval by WSDOT (RCW 46.61.575). For state routes, this approval is with a deviation. Provide an engineering study, approved by the region's Traffic Engineer, with the deviation that shows the parking will not unduly reduce safety and that the roadway is of sufficient width that the parking will not interfere with the normal movement of traffic.

	Divided Multilane	
Design Class	I-1	
Design Year	(1)	
Access Control (2)	Full	
Separate Cross Traffic		
Highways	All	
Railroads	All	
Design Speed (mph)		
Rural	80 (3)	
Urban	70 (4)	
Traffic Lanes		
Number	4 or more divided	
Width (ft)	12	
Median Width (ft)	4 lane	6 lanes or more
Rural —Minimum (5)	40	50
Urban —Minimum	16	22
Shoulder Width (ft)		
Right of Traffic	10 (6)	10 (6)
Left of Traffic	4	10 (6)(7)
Pavement Type (8)	High	
Right of Way (9)		
Rural — Minimum Width (ft)	63 from edge of traveled way	
Urban — Minimum Width (ft)	As required (10)	
Structures Width (ft) (11)	Full roadway width each direction (12)	

	Design Speed (mph)			
Type of Terrain	50	60	70	80
Level	4	3	3	3
Rolling	5	4	4	4
Mountainous	6	6	5	5

Grades (%) (13)

Interstate Notes:

(1) The design year is 20 years after the year the construction is scheduled to begin.

(2) See Chapter 1420 for access control requirements.

(3) 80 mph is the desirable design speed; with a corridor analysis, the design speed may be reduced to 60 mph in mountainous terrain and 70 mph in rolling terrain. Do not select a design speed that is less than the posted speed.

(4) 70 mph is the desirable design speed; in urban areas, with a corridor analysis the design speed may be reduced to 50 mph. Do not select a design speed that is less than the posted speed.

(5) Independent alignment and grade is desirable in all rural areas and where terrain and development permits in urban areas.

(6) 12 ft shoulders are desirable when the truck DDHV is 250 or greater.

(7) For existing 6-lane roadways, existing 6 ft left shoulders may remain when no other widening is required with design exception documentation.

(8) Submit Form 223-528, Pavement Type Determination.

(9) Provide right of way width 10 ft desirable, 5 ft minimum, wider than the slope stake for fill and slope treatment for cut. See Chapter 640 and the Standard Plans for slope treatment information.

(10) In urban areas, make right of way widths not less than those required for necessary cross section elements.

(11) See Chapter 1120 for minimum vertical clearance.

(12) For median widths 26 ft or less, address bridge(s) in accordance with Chapter 1120.

(13) Grades 1% steeper may be used in urban areas where development precludes the use of flatter grades and for one-way down grades except in mountainous terrain.

Geometric Design Data, Interstate
Figure 440-4

Design Class	Divided Multilane				Two-Lane						Undivided Multilane	
	P-1		P-2		P-3		P-4		P-5		P-6 (1)	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
DHV in Design Year (2) NHS	Over 1,500		Over 700		Over 201 (3)		61-200 (4)		60 and under		Over 700	
Non NHS					Over 301		101-300		100 and Under			
Access Control	Full (5)		Partial (5)		(5)		(5)		(5)		(5)	
Separate Cross Traffic												
Highways	All		Where Justified		Where Justified		Where Justified		Where Justified		Where Justified	
Railroads (6)	All		All		All (7)		Where Justified (8)		Where Justified (8)		Where Justified (8)	
Design Speed (mph) (9)	70		70		70	60	70	60	60	60	70	60
Minimum (10)(11)	50		50		50	40	50	40	40	30	40	30
Traffic Lanes												
Number	4 or more divided		4 or 6 divided		2		2		2		4	4 or 6
Width (ft)	12		12		12		12		12		12	11 (12)
Shoulder Width (ft)												
Right of Traffic	10 (13)		10		8		6		4		8	8(14)
Left of Traffic	Variable (15)		Variable (15)									
Median Width (ft)												
4 lane	40 (16)	16	60	16							4	2 (17)
6 or more lanes	48 (16)	22	60	22							4	2 (17)
Parking Lanes Width (ft) — Minimum	None		None		None		None	10	None	10	None	10 (18)
Pavement Type (19)	High				High or intermediate							
Right of Way (20) — Min Width (ft)	(21)	(22)	(21)	(22)	120	80	120	80	100	80	150	80
Structures Width (ft) (23)	Full roadway width (24)				40		36		32		Full roadway width	
Other Design Considerations-Urban					(25)		(25)		(25)		(25)	

Type of Terrain	Rural — Design Speed (mph)					Urban — Design Speed (mph)			
	40	50	60	70	80	30	40	50	60 (26)
Level	5	4	3	3	3	8	7	6	5
Rolling	6	5	4	4	4	9	8	7	6
Mountainous	8	7	6	5	5	11	10	9	8

Grades (%) (27)

Geometric Design Data, Principal Arterial
Figure 440-5a

Principal Arterial Notes:

(1) Justify the selection of a P-6 design class on limited access highways.
(2) The design year is 20 years after the year the construction is scheduled to begin.
(3) Where DHV exceeds 700, consider four lanes. When the volume/capacity ratio is equal to or exceeds 0.75, consider the needs for a future four-lane facility. When considering truck climbing lanes on a P-3 design class highway, perform an investigation to determine if a P-2 design class highway is justified.
(4) When considering a multilane highway, perform an investigation to determine if a truck climbing lane or passing lane will satisfy the need. See Chapter 1010.
(5) See Chapter 1420 and the Master Plan for Limited Access Highways for access control requirements. Contact the HQ Design Office Access & Hearings Unit for additional information.
(6) Contact the Rail Office of the Public Transportation and Rail Division for input on the needs for the railroad.
(7) All main line and major-spur railroad tracks will be separated. Consider allowing at-grade crossings at minor-spur railroad tracks.
(8) Criteria for railroad grade separations are not clearly definable. Evaluate each site regarding the hazard potential. Provide justification for railroad grade separations.
(9) These are the design speeds for level and rolling terrain in rural areas. They are the preferred design speeds for mountainous terrain and urban areas. Higher design speeds may be selected, with justification.
(10) In urban areas, with a corridor analysis these values may be used as the minimum design speed. Do not select a design speed that is less than the posted speed.
(11) These design speeds may be selected in mountainous terrain, with a corridor analysis. Do not select a design speed that is less than the posted speed.
(12) 12 ft lanes are required when the truck DDHV is 150 or greater.
(13) 12 ft shoulders are desirable when the truck DDHV is 250 or greater.
(14) When curb section is used, the minimum shoulder width from the edge of traveled way to the face of curb is 4 ft.
(15) Minimum left shoulder width is to be as follows: four lanes — 4 ft: six or more lanes — 10 ft. For 6-lane roadways, existing 6 ft left shoulders may remain when no other widening is required.
(16) On freeways or expressways requiring less than eight lanes within the 20-year design period, provide sufficient median or lateral clearance and right of way to permit addition of a lane in each direction if required by traffic increase after the 20-year period.
(17) When signing is required in the median of a six-lane section, the minimum width is 6 ft. If barrier is to be installed at a future date, an 8 ft minimum median is required.
(18) Restrict parking when DHV is over 1500.
(19) Submit Form 223-528, Pavement Type Determination.
(20) Provide right of way width 10 ft desirable, 5 ft minimum, wider than the slope stake for fill and slope treatment for cut. See Chapter 640 and the Standard Plans for slope treatment information.
(21) 63 ft from edge of traveled way.
(22) Make right of way widths not less than those required for necessary cross section elements.
(23) See Chapter 1120 for the minimum vertical clearance.
(24) For median widths 26 ft or less, address bridges in accordance with Chapter 1120.
(25) For bicycle requirements, see Chapter 1020. For pedestrian and sidewalk requirements, see Chapter 1025. Curb requirements are in 440.11. Lateral clearances from the face of curb to obstruction are in Chapter 700.
(26) For grades at design speeds grater than 60 mph in urban areas, use rural criteria.
(27) Except in mountainous terrain, grades 1% steeper may be used in urban areas where development precludes the use of flatter grades or for one-way downgrades.

Geometric Design Data, Principal Arterial
Figure 440-5b

Design Class	Divided Multilane		Two-Lane						Undivided Multilane	
	M-1		M-2		M-3		M-4		M-5 [1]	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
DHV in Design Year [2] NHS	Over 700		Over 201 [3]		61-200 [4]		60 and Under		Over 700	
Non NHS			Over 401		201-400		200 and Under			
Access Control	Partial [5]		(5)		(5)		(5)		(5)	
Separate Cross Traffic										
Highways	Where Justified		Where Justified		Where Justified		Where Justified		Where Justified	
Railroads [6]	All		All [7]		Where Justified [8]		Where Justified [8]		Where Justified [8]	
Design Speed (mph) [9]	70		70	60	70	60	60	60	70	60
Minimum [10][11]	50		50	40	50	40	40	30	40	30
Traffic Lanes										
Number	4 or 6 divided		2		2		2		4	4 or 6
Width (ft)	12		12		12		12		12	11 [12]
Shoulder Width (ft)										
Right of Traffic	10		8		6		4		8	8 [13]
Left of Traffic	Variable [14]									
Median Width (ft)										
4 lane	60	16							4	2 [15]
6 lane	60	22								
Parking Lanes Width (ft) — Minimum	None		None		None	10	None	10	None	10 [16]
Pavement Type [17]	High		As required						High or Intermediate	
Right of Way [18] — Min Width (ft)	(19)	(20)	120	80	120	80	100	80	150	80
Structures (ft) [21]	Full Roadway Width [22]		40		36		32		Full Roadway Width	
Other Design Considerations-Urban			(23)		(23)		(23)		(23)	

Type of Terrain	Rural — Design Speed (mph)					Urban — Design Speed (mph)			
	40	50	60	70	80	30	40	50	60 [24]
Level	5	4	3	3	3	8	7	6	5
Rolling	6	5	4	4	4	9	8	7	6
Mountainous	8	7	6	5	5	11	10	9	8

Grades (%) [25]

Geometric Design Data, Minor Arterial
Figure 440-6a

Minor Arterial Notes:

(1) Justify the selection of an M-5 design class on limited access highways.
(2) The design year is 20 years after the year the construction is scheduled to begin.
(3) Where DHV exceeds 700, consider four lanes. When the volume/capacity ratio is equal to or exceeds 0.75, consider the needs for a future four-lane facility. When considering truck climbing lanes on an M-2 design class highway, perform an investigation to determine if an M-1 design class highway is justified.
(4) When considering a multilane highway, perform an investigation to determine if a truck climbing lane or passing lane will satisfy the need. See Chapter 1010.
(5) See Chapter 1420 and the Master Plan for Limited Access Highways for access control requirements. Contact the HQ Design Office Access & Hearings Unit for additional information.
(6) Contact the Rail Office of the Public Transportation and Rail Division for input on the needs for the railroad.
(7) All main line and major-spur railroad tracks will be separated. Consider allowing at-grade crossings at minor-spur railroad tracks.
(8) Criteria for railroad grade separations are not clearly definable. Evaluate each site regarding the hazard potential. Provide justification for railroad grade separations.
(9) These are the design speeds for level and rolling terrain in rural areas. They are the preferred design speeds for mountainous terrain and urban areas. Higher design speeds may be selected, with justification.
(10) In urban areas, with a corridor analysis these values may be used as the minimum design speed. Do not select a design speed that is less than the posted speed.
(11) These design speeds may be selected in mountainous terrain, with a corridor analysis. Do not select a design speed that is less than the posted speed.
(12) When the truck DDHV is 150 or greater, consider 12 ft lanes.
(13) When curb section is used, the minimum shoulder width from the edge of traveled way to the face of curb is 4 ft.
(14) The minimum left shoulder width is 4 ft for four lanes and 10 ft for six or more lanes. For 6-lane roadways, existing 6 ft left shoulders may remain when no other widening is required.
(15) When signing is required in the median of a six-lane section, the minimum width is 6 ft. If barrier is to be installed at a future date, an 8 ft minimum median is required.
(16) Restrict parking when DHV is over 1500.
(17) Submit Form 223-528, Pavement Type Determination.
(18) Provide right of way width 10 ft desirable, 5 ft minimum, wider than the slope stake for fill and slope treatment for cut. See Chapter 640 and the Standard Plans for slope treatment information.
(19) 63 ft from edge of traveled way
(20) Make right of way widths not less than those required for necessary cross section elements.
(21) See Chapter 1120 for the minimum vertical clearance.
(22) For median widths 26 ft or less, address bridges in accordance with Chapter 1120.
(23) For bicycle requirements, see Chapter 1020. For pedestrian and sidewalk requirements see Chapter 1025. Curb requirements are in 440.11. Lateral clearances from the face of curb to obstruction are in Chapter 700.
(24) For grades at design speeds grater than 60 mph in urban areas, use rural criteria.
(25) Except in mountainous terrain, grades 1% steeper may be used in urban areas where development precludes the use of flatter grades or for one-way downgrades.

Geometric Design Data, Minor Arterial
Figure 440-6b

Design Class	**Undivided Multilane**		**Two-Lane**					
	C-1		C-2		C-3		C-4	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
DHV in Design Year (1) NHS Non NHS	Over 900		Over 301 (2) Over 501		201-300 (3) 301-500		200 and under 300 and Under	
Access Control	(4)		(4)		(4)		(4)	
Separate Cross Traffic Highways Railroads (5)	Where Justified Where Justified (6)		Where Justified All (6)		Where Justified Where Justified (6)		Where Justified Where Justified (6)	
Design Speed (mph) (7) **Minimum** (8)(9)	70 40	60 30	70 50	60 40	70 50	60 40	60 40	60 30
Traffic Lanes Number Width (ft)	4 12	4 or 6 11 (10)	2 12		2 12		2 12	
Shoulder Width (ft)	8	8 (11)	8		6		4	
Median Width — Minimum (ft)	4	2 (12)						
Parking Lanes Width (ft) — Minimum	None	10	None		None	10	None	10
Pavement Type (13)	High or Intermediate		As required					
Right of Way (ft) (14)	150	80	120	80	120	80	100	80
Structures Width (ft) (15)	Full Roadway Width		40		36		32	
Other Design Considerations-Urban	(16)		(16)		(16)		(16)	

Type of Terrain	**Rural — Design Speed (mph)**					**Urban — Design Speed (mph)**			
	30	40	50	60	70	30	40	50	60 (17)
Level	7	7	6	5	4	9	9	7	6
Rolling	9	8	7	6	5	11	10	8	7
Mountainous	10	10	9	8	6	12	12	10	9

Grades (%) (18)

Geometric Design Data, Collector
Figure 440-7a

Collector Notes:

(1) The design year is 20 years after the year the construction is scheduled to begin.

(2) Where DHV exceeds 900, consider four lanes. When the volume/capacity ratio is equal to or exceeds 0.85, consider the needs for a future four-lane facility. When considering truck climbing lanes on a C-2 design class highway, perform an investigation to determine if a C-1 design class highway is justified.

(3) When considering a multilane highway, perform an investigation to determine if a truck climbing lane or passing lane will satisfy the need. See Chapter 1010.

(4) See Chapter 1420 and the Master Plan for Limited Access Highways for access control requirements. Contact the HQ Design Office Access & Hearings Unit for additional information.

(5) Contact the Rail Office of the Public Transportation and Rail Division for input on the needs for the railroad.

(6) Criteria for railroad grade separations are not clearly definable. Evaluate each site regarding the hazard potential. Provide justification for railroad grade separations.

(7) These are the design speeds for level and rolling terrain in rural areas. They are the preferred design speeds for mountainous terrain and urban areas. Higher design speeds may be selected, with justification. Do not select a design speed that is less than the posted speed.

(8) In urban areas, with a corridor analysis these values may be used as the minimum design speed. Do not select a design speed that is less than the posted speed.

(9) These design speeds may be selected in mountainous terrain, with a corridor analysis. Do not select a design speed that is less than the posted speed.

(10) Consider 12 ft lanes when the truck DHV is 200 or greater.

(11) When curb section is used, the minimum shoulder width from the edge of traveled way to the face of curb is 4 ft.

(12) When signing is required in the median of a six-lane section, the minimum width is 6 ft median. If barrier is to be installed at a future date, an 8 ft minimum median is required.

(13) Submit Form 223-528, Pavement Type Determination.

(14) Provide right of way width 10 ft desirable, 5 ft minimum, wider than the slope stake for fill and slope treatment for cut. See Chapter 640 and the Standard Plans for slope treatment information.

(15) See Chapter 1120 for the minimum vertical clearance.

(16) For bicycle requirements, see Chapter 1020. For pedestrian and sidewalk requirements see Chapter 1025. Curb requirements are in 440.11. Lateral clearances from the face of curb to obstruction are in with Chapter 700.

(17) For grades at design speeds grater than 60 mph in urban areas, use rural criteria.

(18) Except in mountainous terrain, grades 1% steeper may be used in urban areas where development precludes the use of flatter grades or for one-way downgrades.

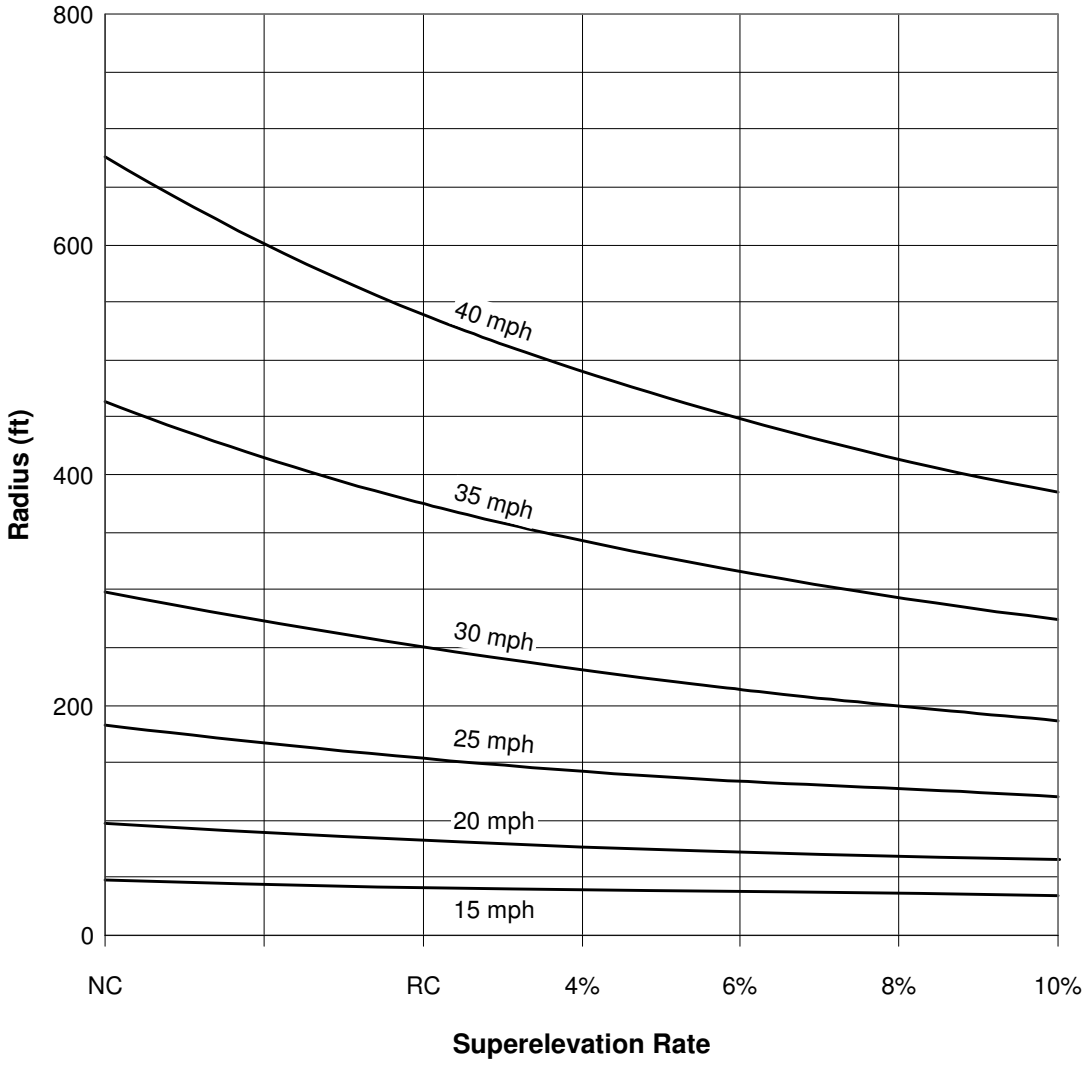
Geometric Design Data, Collector
Figure 440-7b

Design Class	Divided Multilane		Undivided Multilane		Two-Lane	
	UM/A1	UM/A2	UM/A3	UM/A4	UM/A5	UM/A6
DHV in Design Year (1)	Over 700	Over 700	700 – 2,500	Over 700	All	All
Design Speed (mph)	Greater than 40	40 or less	35 to 40	30 or less	Greater than 40	40 or less
Access	(2)	(2)	(2)	(2)	(2)	(2)
Traffic Lanes						
Number	4 or more	4 or more	4 or more	4 or more	2	2
Width (ft) NHS	12 (3)(4)	12 (3)	12 (3)	12 (3)	12 (3)(6)	12 (3)
Non NHS	11 (4)	11 (5)	11 (5)	11 (5)	11 (6)	11 (7)
Shoulder Width (ft)						
Right of Traffic	10	10 (8)	8 (8)	8 (8)	8 (9) (8)	4 (8)
Left of Traffic	4	4 (8)				
Median Width (ft)	10 (10)	3 (10)(11)	(12)	(12)		
Parking Lane Width (ft)	None	10 (13)	10 (13)	8 (14)	10 (15)	8 (14)
Structures Width (ft) (16)	Full roadway width (17)		Full roadway width		32	30
Other Design Considerations	(18)	(18)	(18)	(18)	(18)	(18)

Urban Managed Access Highways Notes:

(1) The design year is 20 years after the year the construction is scheduled to begin.
(2) The urban managed access highway design is only used on managed access highways. See WAC 468-51 and WAC 468-52.
(3) May be reduced to 11 ft with justification.
(4) Provide 12 ft lanes when truck DDHV is 200 or greater.
(5) Consider 12 ft lanes when truck DDHV is 200 or greater.
(6) Provide 12 ft lanes when truck DHV is 100 or greater.
(7) Consider 12 ft lanes when truck DHV is 100 or greater.
(8) See Figure 440-3a when curb section is used.
(9) When DHV is 300 or less, may be reduced to 6 ft. When DHV is 200 or less, may be reduced to 4 ft.
(10) 12 ft desirable. At left-turn lanes, the minimum median width is 12 ft to accommodate the turn lane.
(11) The minimum median width is 10 ft when median barrier is used.
(12) 2 ft is desirable. When a TWLTL is present 13 ft is desirable, 11 ft is minimum.
(13) Prohibit parking when DHV is over 1500.
(14) 10 ft desirable.
(15) Prohibit parking when DHV is over 500.
(16) See Chapter 1120 for minimum vertical clearance.
(17) See Chapter 1120 for median requirements.
(18) For bicycle requirements, see Chapter 1020. For pedestrian and sidewalk requirements, see Chapter 1025. Lateral clearances from the face of curb to obstruction are in with Chapter 700. For railroad and other roadway grade separation, maximum grade, right of way requirements, and pavement type for the functional class, see Figures 440-5a through 7b

Geometric Design Data, Urban Managed Access Highways
Figure 440-8



Note:

1. NC = Normal crown. All or part of the roadway has 2% adverse crown.
2. RC = Reverse crown. 2% super.

Superelevation Rates for Low-Speed Urban Managed Access Highways
Figure 640-12b